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ABSTRACT OF THE PROCEEDINGS OF THE
SECOND ANNUAL MEETING OF THE AMERICAN SOCIETY OF ICHTHYOLOGISTS AND
HERPETOLOGISTS, held in the Lecture Hall of the
Academy of Natural Sciences of Philadelphia, March
8, 1917.



THE FISHES OF THE LANG-CHAPIN CONGO
EXPEDITION. John T. Nichols. (No abstract.)
These results will be incorporated in Mr. Nichol's forth-
coming report to be published by the American Museum
of Natural History, New York.

A RESTORATION OF THE CARBONIFEROUS
AMPHIBIAN ERYOPS. Dwight Franklin. (No
abstract.)

SOME EXPERIENCES WITH SNAKES AND
TURTLES. J. Fletcher Street. (No abstract.)

NOTES ON THE TAXONOMIC VALUE OF
DERMAL DENTICLES AND TEETH IN IDENTI-
FYING SHARKS. Lewis Radcliffe.

Sharks represent one of the most interesting
groups in the field of ichthyology, but a very difficult
one for the average worker. For many of the species
it is almost impossible to find satisfactory descriptions,
or was so until very recently. One reason for this is
that we cannot transport a shark 10 to 50 feet in
length, weighing from 300 to 10,000 pounds or more,
with ease to our laboratories, and very often our field
notes do not suffice for identification purposes. Even
when it is possible to bring large specimens to the
laboratory, identification must be made at once and
the remains cast adrift, the element of large size pro-
hibiting the preserving of large numbers for compara-

tive purposes. On the other hand, there is a paucity of material in our collections which could have been preserved easily and would have aided us greatly in our studies.

In the summers of 1912-14, while at Beaufort, N. C., excellent opportunities were afforded for collecting material, but very little time for studying it. This directed attention to the minimum of material that should be saved and the following plan developed:

1. Make as detailed field notes and measurements as time will permit. Include careful descriptions of parts of head, form of fins and distinctive color-markings.

2. If provided with a camera, photograph lateral view of entire fish and ventral surface of head including pectorals. These often aid in checking measurements and supply important details which may otherwise be overlooked.

3. Preserve a piece of shagreen from the middle of the side below the first dorsal fin. A piece 3 inches square is ample and may be preserved in alcohol in a small vial or bottle, or dried.

4. Remove the jaws entire. For doing this a stout, sharp pocket or hunting knife is much more satisfactory than an axe or cleaver and after a little practice you will be surprised at the ease with which it may be done. As soon as convenient the jaws should be cleaned and dried. They are then easily shipped by parcels post or express.

When one is prepared to study the material collected in the field, a small piece of the shagreen should be permanently mounted on a dry cell. The denticles may then be studied with the microscope after which the slide may be filed for future comparisons. At first one may be somewhat bewildered by the marked similarity of denticles of various species. Others, however, will be found with characters which are distinctive and by the process of elimination assistance will be afforded.

In studying the denticles it should be noted whether they are close set, imbricated or more or less scattered, whether uniform or variable in size, the number and character of the keels on the outer surface and the individual variation with age.

As the worker becomes familiar with the denticles of various species he will find the habit of briefly examining those of new material an important aid in his cursory search for clews as to the identity of the species. Only a few days ago a section of a shark, including that part of the body between the origin of the first dorsal and base of the ventral fins, was received and identified at once by this character. Without this knowledge identification would have been difficult and it oftentimes will prove so. In fact this point must be emphasized that these are not an open sesame by which all sharks may be readily identified, but that in a troublesome group they are an aid. In addition the material is easily obtained and retained in permanent form for comparative purposes.

All who have made a study of sharks know the important diagnostic value of the teeth. Considering the ease with which the jaws may be removed and preserved, the dearth of such material in collections is surprising. While there is some range of variation in the number of rows of teeth, there is a marked constancy of form in a given species.

In large measure the practice of fishermen is to fish intensively for the more important forms and allow the unimportant ones to live and multiply, often at the expense of the more valuable species. If practical uses can be developed for those that are especially destructive to the important forms our gain may be twofold. Many are familiar with the grayfish campaign inaugurated last year by the Bureau of Fisheries, and that this fish is being canned on both coasts. The demand is at least ten times the pack and the eggs as well as the livers are by-products of value.

Owing to the scarcity of leathers the time seemed opportune to interest tanners in the utilization of fish skins. Over 225 shark hides and about 50 skins of other fishes, including cod, hake, grouper, garfish and rays, have been distributed among about 25 tanners for experimentation and a few very creditable samples of the finished product have been received.

The utilization of this product is not a new idea as many have experimented with it almost universally without success. Lack of success is due to the fact that fish skins have to be processed in a special manner in order that they may be tanned into acceptable grades

of leather. Two companies are now tanning them and are in the market for large quantities of raw hides and two others are perfecting tanning processes and preparing to engage in the industry. Fishermen who have not known that these products have a value are being advised as to the proper methods for removing the skins and curing and boxing them for shipment. Those collecting this material are furnished information as to where it may be marketed. The Bureau of Standards will test the tanned skins as to tensile strength and wearing qualities and later manufacturers of leather goods will be encouraged to experiment with the finished product to ascertain to what uses it is best adapted. Thus it is hoped that an economic loss will be turned into a profit.

ON CERTAIN CONGO REPTILES. Herbert Lang. (No abstract.)

FISHERY WORK IN THE TROPICS. Alvin Seale. (No abstract.)

SOME REMARKS ON THE HISTORY OF THE HERPETOLOGICAL COLLECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA. Dr. Witmer Stone. (No abstract.)

NEW GENERA OF DEEP-WATER GURNARDS (*Peristidiidae*). Dr. Hugh M. Smith. (No abstract.) These results will probably appear in the Proceedings of the United States National Museum.

BREEDING HABITS OF *Ambystoma opacum*. G. P. Engelhardt. (No abstract.)

THE CAPELIN (*Mallotus villosus*), WITH NOTES ON ITS OCCURRENCE ON THE COAST OF MAINE. Dr. William C. Kendall.

Recently the Bureau of Fisheries, Washington, D. C., received for identification three specimens of fish unrecognized by fishermen in the locality where they were taken. Recognizing that they constituted a new record for the coast of Maine, information supplied by Mr. H. M. Loomis, Director of the Office of Sardine Inspection, follows: "Last fall these fish had been noted from time to time during October and November with receipts of herring, but they did not appear in any great quantity with the 'herring' until the latter part of November, or from the 26th to 30th.

On the 27th three hogsheads of 'herring,' or about 3000 pounds, were received from the Dennysville River, and were found to contain over two hogsheads of capelin. I am unable to state anything regarding capelin earlier in the season, as no particular attention was paid to them, as distinguished from the common smelt." The species has not previously been recorded south of Halifax, Nova Scotia. In a number of books and catalogues of fishes pertaining to the western Atlantic vague references to the Halifax record are found. These seem to be based upon the list of fishes of Nova Scotia by J. Mathew Jones, published in 1863. Aside from it as a new Maine record interest attaches to the occurrence of capelin in Panamaquoddy Bay, as during the summer the water was unusually cold off shore, at intermediate depths on the Continental Shelf as far south as the latitude of the Middle Atlantic States. This cold water was accompanied by an abundance of planktonic fish food of species usually found in more northern waters (Fisheries Service Bulletin, September 1, 1916, No. 16, p. 1). The possible connection of these phenomena with the presence of capelin so far south of its normal range is obvious. The Halifax occurrence previously referred to may be accounted for in the same way. This is indicated by a subsequent notice by the same J. Mathew Jones (in a letter to *Forest and Stream*, vol. 10, 1878, p. 502). If Mr. Loomis had asked for information regarding the habits of the capelin he would have likely been given an extract from the short account by G. Brown Goode in *Fishery Industries*, which is about as complete as most recent data available allows. This account is largely quotations from others, and curious to note the most thorough account of the fish appears to have been overlooked. Such is that by the previously mentioned Mr. Jones, read December 7, 1863, before the Nova Scotia Institute of Natural Science and published in the *Transactions* of that institution (see vol. 2, part 2, pp. 4-13). In Dr. Goode's account of the spawning habits of the capelin one Charles Lanman is credited with a very thorough observation. However, it has subsequently appeared that Charles Lanman was an "inveterate cribber" in things ichthyological. In the article just mentioned Captain Hardy quotes verbatim, giving full credit from an earlier account of the spawning habits of the fish given by Lieutenant Edward Chappell, R. N. (*Voyage of His Majesty's Ship Rosamond to*

Newfoundland and the Southern Coast of Labrador, 1818, pp. 131-134). Charles Lanman's account is a word for word transcription of this account, but whether his apology is due Captain Hardy or Lieutenant Chappell the Recording Angel only knows.

BITTEN BY A RATTLESNAKE. William T. Davis. (No abstract.)

REPTILE LORE OF THE NORTHERN INDIANS. Dr. F. G. Speck. (No abstract.)

NOTES ON THE TYPES OF WEST AFRICAN SPECIES OF LIZARDS DESCRIBED BY DR. EDWARD HALLOWELL. Karl P. Schmidt. (No abstract.) The results set forth in this communication will appear in Mr. Schmidt's forthcoming report on the Lang-Chapin Congo reptiles, to be published by the American Museum of Natural History, New York.

HERPETOLOGY AT THE UNIVERSITY OF MICHIGAN. Dr. Alexander G. Ruthven.

It has seemed to me that a brief account of the work in herpetology which is being done at the University of Michigan would probably be of some interest to the Society since the University is geographically a little remote from the museums where most of the research in this field is carried on, and it has been thought best, in view of the conditions, to emphasize a certain field and method of investigation.

The nature of the work in herpetology in the Museum of Zoology is determined by the general policy adopted for the Museum. This policy covers both the field and the methods of investigation, and it is restricted both because the Museum is a state institution and because its resources are so limited that it is necessary to concentrate them to obtain the greatest results. Very briefly, it is purposed to make an exhaustive study of the Michigan fauna, and to encourage more comprehensive studies only in those groups which the members of the staff select for individual study. It has been decided to emphasize research, to attach secondary importance to the assisting of schools and local naturalists and to consider as third in value the preparation of exhibits. In the field work the environmental relations are to be emphasized, in the belief that these relations are an important factor in determining distribution and that a knowledge of the

geography gives important clues to systematic affinities.

This policy has always had the support of the University authorities and has not been modified in the ten years since its adoption. During this time the reptiles and amphibians have received considerable attention, as they are groups selected for individual study. They have been studied in some part of Michigan every year, and also in various other places in North America, Mexico and South America, with the result that the fauna of the state is becoming fairly well known and contributions have been made to knowledge of the faunæ of other regions and also it is hoped to the general subjects of zoogeography and systematic herpetology.

Consistently with the general policy the field work on reptiles and amphibians has been restricted to intensive environmental studies. The method employed is to select a general region which presents a geographical problem with apparently few complications and not too large to be covered in the time available, to locate the possible habitats, and to work each habitat thoroly to obtain all of the inhabitants and to determine as much as possible of the habitat relations.

At the present time we are working on the material obtained by expeditions sent to the Santa Marta Mountains, Colombia, in 1913, to British Guiana in 1914, to the Davis Mountains, Texas, in 1914 and 1916, and on preliminary collections from the Olympic Mountains in Washington. To illustrate the nature of the general problems attacked, permit me to say that the main object of the work in Colombia is to determine the effects of isolation and of precipitous topography, the problem attacked in Guiana is the effect of the old sand reefs on the fauna, the work in the Davis Mountains is in the nature of an investigation of the problems of altitudinal distribution in an arid region, and in the Olympics it is the altitudinal distribution in a wet region and the occurrence of forms with Asiatic affinities upon which it is hoped to obtain information. Although other expeditions will be sent to each of the regions mentioned, it is apparent that the field work has yielded results, from which conclusions bearing on the problems stated may be drawn.

That data on the relations between the animal at all stages of its life history and its environment are valuable, must, I believe, be evident to every one. The

course of evolution in a group can never be demonstrated by analytical systematic work, synthetic results can only be relied upon when supported by a knowledge of the geographical history of the group, and environmental relations are a potent factor in geography. It may also be pointed out in conclusion that while fewer species will be obtained by the collector in the intensive study of a small area, this work may be depended upon to yield large returns not only in habitat data, but also in information on habits, life histories and individual variation, and is the most efficient way of obtaining a comprehensive knowledge of the fauna of a locality.

AN EXTENSION OF THE RANGE OF
CLEMMYS MUHLENBERGII. Dr. Harold L. Babcock.

The northern limit of distribution for Muhlenberg's Turtle, *Clemmys muhlenbergii* (Schweigger) has been considered, heretofore, to pass through southern New York State. It is therefore of interest to herpetologists to report a hitherto unpublished record of occurrence of this turtle at Newport, Rhode Island. In 1902, Mr. Alexander Agassiz took three specimens (two males and one female) at Newport, Rhode Island, and presented them on September 23 to the Museum of Comparative Zoology at Cambridge, Massachusetts, where they now are. While it is possible that these were escaped caged animals, it is not at all likely. This turtle is not generally abundant throughout its range and often occurs locally as in this instance. As several southern New York records exist it is probable that the range extends through southern Connecticut as well, although there are no published records as yet.

Muhlenberg's turtle often leaves the water to lead a distinctly terrestrial existence, but is found usually in swampy localities near clear running streams. It is able to swallow food without submerging the head.

This record not only establishes a new northern limit of distribution for this species but adds, as well, a new member to the chelonian fauna of New England.

SOME NOTES ON THE BREEDING HABITS
OF LOCAL CATFISHES. Henry W. Fowler.

The white cat (*Ameiurus catus*) spawns in early summer, or over a period of about one week in duration. About Philadelphia the usual time is between May 28 and June 4. The nest is a hollow depression, scooped

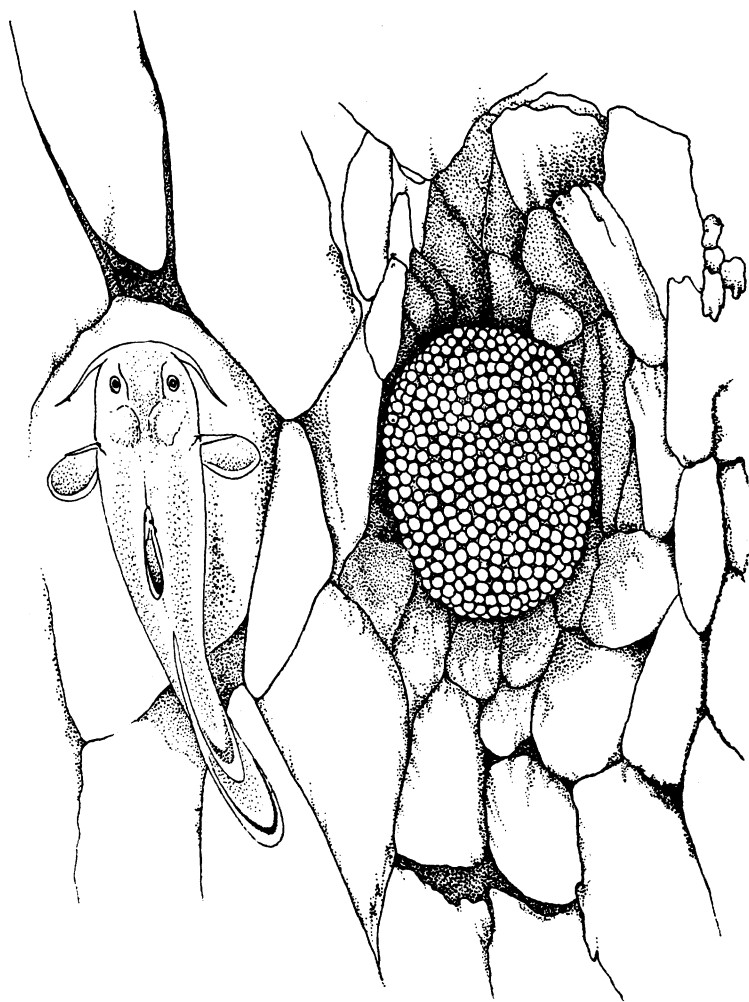
out of the bottom by both sexes. It is usually situated in a gravel-bank or a sand-bank. The labor of excavation is performed by both fishes carrying out pebbles in their mouths or brushing about with their fins. In dimensions the nest may reach a diameter from thirty inches to a yard and may vary in depth from twelve to fifteen inches, or even eighteen. When spawning the fish may remain quiet in the bottom, close together and parallel. The eggs appear to be forced out of the female by a vibrating of her body as she presses against the male, who remains close alongside showing the same movement. The milt and eggs are expressed at the same time, or at intervals until the spawning is completed. The clusters of eggs are all deposited in a day or so, and fall in a heap in the bottom of the nest. They may be covered for a greater or lesser extent with the surrounding gravel by both parents, and sometimes to a depth of five or six inches. In color the eggs are of the usual yellowish-white tint, and number about 1400 to 1500. The care of the eggs is shared mostly by the male, though both sexes may even act as guardians, or the female alone may even guard the nest. At least in the aquarium on one occasion such occurred, and she even fought and drove her companion away. The eggs are very adhesive and usually remain in compact masses until hatched, which occurs in two or three days. The young are brooded for some time by the male, in similar fashion to those of other species in the genus.

The spawning habits of the yellow cat (*Ameiurus natalis*) are similar to those of the common catfish. The nest is a hollow or small excavation usually but little larger than the fish, or it may be situated in a hole or even a sort of a burrow. If a burrow is used it may extend for an inclined depth of two feet. It is excavated as a nest by the labor of both sexes. The spawning season is of about two weeks extent or from May 15 to June 1. Mr. R. E. Van Deusen, who has found the burrow-like nests in western New York, noticed that often small roots from the surrounding vegetation would be left in the burrow, and frequently served as an anchorage for the yellowish-white adhesive eggs. The latter are deposited usually to the extent of about 300 to 700 in a nest. The male guards and broods the young, and when the latter leave the nest cares for his charge for some time.

The nesting-habits of our common catfish or bullhead (*Ameiurus nebulosus*) are, perhaps, best known and have been noticed by a number of observers. It nests in various situations, or in water of from several feet in depth to that of but a few inches. Though only a few nests were noticed in a restricted area, sometimes a dozen or more may be found on one shoal and close to one another. Frequently the fish take advantage of any objects, such as logs, rocks, etc., for sheltering the nest. The eggs are deposited at intervals and may number from about 50 to 500 or more. In the construction of the nest, spawning habits and care of the young, this species acts like the white cat. There is always a great range of variation in many of these features, especially due to the individuals and conditions. No two nests were ever found exactly alike, and the same was true of the spawners. Even the female will sometimes, at least in the aquarium, brood her young, and in most cases the parents will devour the eggs, especially if disturbed. Usually the male guards the nest and broods the young, as the female deserts the nest by the time the young hatch. When just hatched the young catfish collect in a dense school, move in circles or close gyrations, and the whole crowd in constant motion.

The black bullhead (*Ameiurus melas*) has not been observed spawning by me. Dr. Van Deusen gives me the following notes on a pair spawning in the aquarium July 15, 1916. Both sexes assumed charge of the nest and both guarded the young. Both parents remained in the nest at the same time and at alternate times. The female was apparently the more savage and the male would bite one's finger when disturbed. The nest was a shallow depression, scooped out of the bottom, and its diameter about equal to the fish's length. The eggs, when deposited, were 200 and of a pale creamy-white color. As the water was warm they hatched in five days.

During the past summer I was so fortunate as to find the stone cat (*Schilbeodes insignis*) nesting. On July 2, with Mr. H. E. Thompson, we visited the middle course of the Tohickon Creek. This is a small tributary of the Delaware, flowing through typical Piedmont country a few miles above Trenton on the Pennsylvania side. At the point we visited, the stream was shallow, with a gentle current of pure fresh water flowing over



NEST and EGGS of *SCHILBEODES INSIGNIS*
(Slightly Reduced)

stones and rocks. Below are long reaches of more smooth water, only occasional rocks or larger stones appearing at intervals, and the banks with long grasses and other vegetation. Just above a riff, or small rapids, formed by some more crowded rocks or boulders to form a sort of natural dam is a somewhat quiet extent of water. This was the nesting ground and extended about 200 yards or more, but as conditions did not offer suitable stones or rocks we did not explore further. Below the limits outlined we did not find any nests, and only an occasional stone-cat. Altogether ten nests were located, eight with eggs and two with newly hatched young. These nests were simply very shallow excavations below flat rocks, usually under those situated near the middle of the stream, at least well off from the shore. The rocks in question were in most every case flattened more or less, and in diameter would range from one foot to nearly twice as much. By simply turning over such a stone the fish and his eggs or young would be discovered below. As a constant current of clear water passes all about or over the eggs, they are doubtless well freshened or cleansed. Upon first raising a stone the most conspicuous object was the very pale-creamy to yellowish-white mass of eggs or young, the latter evidently just hatched. It was our plan in studying these fishes to poise the stone on end, though care was required in raising it, as its elevation must be gradual so the current of water could carry off the sediment or other debris and at the same time not disturb the fish or his charge too much. After the water has cleared sufficiently the male fish may be made out, usually lying placidly near his charge, or, if more timorous, in the shadow of the up-raised stone. In no case was he savage, rather appearing either passive or seclusive. A conspicuous character of the guardian male is the conspicuously pale nasal and maxillary barbels as well as the edges of the fins, all appearing more or less milk-white as the fish is seen in the water. The male would scarcely allow himself to be handled. In depth the cavity forming the nest proper would scarcely exceed the dimensions of the mass of eggs in some cases, to twice as large in others. The depth of the cavity was not much over two inches, and rarely three or more. Each egg measured about three mm. in diameter, and by rough estimate about 200 were deposited in a nest. In most cases this egg-mass would not exceed 55 mm. in length or diameter,

and as the crevice forming the bottom of the nest was variable, so too the complement of eggs would vary from spherical to ellipsoid in form. The egg-mass is very compact, and each egg is quite adherent to its fellow. In no case could we actually find the male directly on or about the eggs, but do not doubt that he may assume such positions. In some nests the young had just hatched and they were all crowded together, a constantly moving compact mass. The males attending such nests were not more bold than those with eggs.

The most interesting and striking feature of the nesting of this species is that unlike any of our other catfishes it always appears to lay its eggs below flattened stones, situations in which it dwells continuously. Though unable to give any details as to the parental care, it would seem quite likely that the male may brood the young for at least some time. Associated in the spawning grounds were numerous small fishes, as silver fins (*Notropis whippii analostomus*), red fins (*N. cornutus*), black-nosed dace (*Rhinichthys atronasmus*), suckers (*Catostomus commersonnii*), killfish (*Fundulus diaphanus*), sunfish (*Lepomis auritus*) and darters (*Boleosoma nigrum olmstedii*). As the eggs were fairly well protected in their rocky retreats, besides guarded by the vigilant male, it is hardly likely that any great depredations were committed by the smaller fishes in the vicinity. Once, when we disturbed a nest of young, several carried helplessly on by the current were seen devoured by a minnow. The newly hatched young are the same pale creamy-white color as the eggs, at least in their early stages, and may not assume the dark coloration of the very young of the common bullhead.

ILLUSTRATIONS OF FISH IN MEDIAEVAL
MANUSCRIPTS AND EARLY PRINTED BOOKS.
Dr. Charles R. Eastman. (No abstract.)



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